

IN THE CLAIMS:

Please cancel claims 2-5 and 8-10 without prejudice.

Please amend the claims as follows:

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101
1. (4x Amended) A method for improving optical interactance measurements comprising the steps of:
- passing illumination along a plurality of different transmission paths through an interior portion of a material having a characteristic to be measured;
- defining each of said paths by [two distinct] corresponding and separated surface areas [of] on said material, one of said surface areas for passing illumination into said material and the second of said surface areas for passing transmitted illumination from said material for detection, at least one of said surface areas, of [one] each of said paths being extended in length at substantially constant spacing from the other surface area of said [one path;] each of said paths, the total length of said extended surface area of said each of said paths being substantially greater than the mean distance separating said corresponding and separated surface areas defining said each of said paths;
- sensing a plurality of independent signals developed at the same time or in rapid sequence representing optical informa-

tion obtained from within said material in response to said illumination passing along said different paths, each independent signal corresponding to a particular path; and

processing said signals in accordance with appropriate modeling techniques to determine qualitative or quantitative characteristics of the material.

1. (4x Amended) A method for improving optical

Claim 2, line 1 change "claim 1" to --claim 33--.

Claim 6 (3x Amended). [The method of claim 1] A method for improving optical interactance measurements comprising the steps of:

passing illumination along a plurality of different transmission paths through an interior portion of a material having a characteristic to be measured;

defining each of said paths by corresponding and separated surface areas on said material, one of said surface areas for passing illumination into said material and the second of said surface areas for passing transmitted illumination from said material for detection, at least one of said surface areas of each of said paths being extended in length at substantially constant spacing from the other surface area of said each of said paths, the total length of said extended surface area of said each of said paths being substantially greater than the distance separating said corresponding and separated surface areas

defining said each of said paths;

[including the step of] directing the illumination at the surface of said material at an angle with respect to the illuminated surface of said material and generally towards the respective detection surface area on said material;

sensing a plurality of independent signals developed at the same time or in rapid sequence representing optical information obtained from within said material in response to said illumination passing along said different paths, each independent signal corresponding to a particular path; and  
processing said signals in accordance with appropriate modeling techniques to determine qualitative or quantitative characteristics of the material.

7. (4x Amended) Apparatus for optical interactance measurements of an interior portion of a material, said measurements being effected by passing illumination through portions of the material comprising:

aperture means for defining corresponding [distinct] and separated [illumination and detection] surface areas on said material for defining each of a plurality of transmission paths [within] through an interior portion of said material, one of said surface areas for passing illumination into said material and the second of said surface areas for passing transmitted illumination from said material for detection, at least one of

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said surface [area of at least one] areas of each of said transmission paths [extending in a direction substantially transverse to the direction of illumination passage along said one transmission path, being extended in length and substantially constantly spaced from its corresponding surface area, the total length of said extended surface area of said each of said transmission paths being substantially greater than the mean distance separating said corresponding and separated surface areas defining said each of said transmission paths;

means for directing illumination onto said illumination surface areas and along said transmission paths;

means for sensing optical information indicative of said interior portion of said material [and] developed by illumination passing along said transmission paths [at] to said detection surface areas of said transmission paths;

means, responsive to said sensing means, for developing a plurality of independent signals corresponding in number to said plurality of paths, said signals representing said optical information obtained from within said material; and

means for processing said signals in accordance with appropriate modeling techniques to determine qualitative or quantitative characteristics of the material.

*Claim 8  
has been  
cancel*

Claim 8, line 1, change "claim 7" to --claim 36--.

Claims  
are  
has  
cancel

Claim 9, line 1, change "claim 7" to --claim 36--.

Claim 10, line 1, change "claim 7" to --claim 36--.

ion path, said extended in length and substantially constantly

26. (3x Amended) Apparatus for improving optical  
interactance and transmittance measurements comprising:

~~probe being an elongated probe having a body portion and a tip~~  
portion, the body portion comprising a central tubular element  
surrounded by an annular outer element;

the tip portion having a central aperture which commu-  
nicates with said central tubular element and a plurality of  
rings which communicate with said annular outer element;

[the ring in said tip portion being angled with respect  
to the longitudinal axis of the probe;]

a plurality of [the] fiber optic bundles whose number  
corresponds to said plurality of rings being disposed within said  
outer element, each bundle being arranged annularly within a  
respective ring at [one] said tip end [to exit at a respective  
ring] for receiving optical information [relating to] from within  
a particular material and, at the other end, each bundle being  
adapted to be connected to a detector for developing [s] an  
independent signal corresponding to an illumination path through  
said material, and

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G4  
said central tubular element [being] containing optical elements connected [at one end] with a source of illumination, which illumination will exit at the central aperture[;]

[whereby independent signals responsive to said illumination representing said material information may be developed and whereby surface phenomena of said material may be excluded during measurement] ~~led probe having a body portion and a tip~~

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33. (Amended) [The method of claim 1] A method for improving optical interactance measurements comprising the steps of:

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passing illumination along a plurality of different paths through an interior portion of a material having a characteristic to be measured;

[including the step of] defining each of said paths by [at least one extended surface area] corresponding and separated surface areas on said material, one of said surface areas for passing illumination into said material and the second of said surface areas for passing transmitted illumination from said material for detection, at least one of said surface areas of each of said paths being extended in length at substantially constant spacing from the other surface area of said each of said paths, the total length of said extended surface area of said each of said paths being substantially greater than the mean distance separating said corresponding and separated surface

areas defining said each of said paths, an extended surface area of at least one of said paths being [distinct and] contained within the boundary defined by an extended surface area of another of said paths and being substantially surrounded by the extended surface area of said another of said paths;

sensing a plurality of independent signals developed at the same time or in rapid sequence representing optical information obtained from within said material in response to said illumination passing along said different paths, each independent signal corresponding to a particular path; and

processing said signals in accordance with appropriate modeling techniques to determine qualitative or quantitative characteristics of the material.

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Claim 34, line 1, change "claim 1" to --claim 33--.

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35. (Amended) [The method of claim 1] A method for improving optical interactance measurements comprising the steps of:

passing illumination along a plurality of different paths through an interior portion of a material having a characteristic to be measured;

defining each of said paths by corresponding and separated surface areas on said material, at least one of said surface areas of one of said paths being extended in length at

substantially constant spacing from the other surface area of said one path;

sensing a plurality of independent signals developed at the same time or in a rapid sequence representing optical information obtained from within said material in response to said illumination passing along said different paths, each independent signal corresponding to a particular path; and

processing said signals in accordance with appropriate modeling techniques to determine qualitative or quantitative characteristics of the material;

wherein said steps of passing illumination and sensing [steps] are provided by an instrument for said interactance measurement and said method further includes the steps of moving said instrument a predetermined distance away from said material and performing a reflectance measurement of said material.

36. (Amended) [The apparatus of claim 7 wherein said] Apparatus for optical interactance measurements of an interior portion of a material, said measurements being effected by passing illumination along a plurality of different transmission paths through an interior portion of a material having a characteristic to be measured, comprising:

aperture means [are] operative to define each of said paths by [at least one extended surface area] corresponding and separated surface areas on said material, one of said surface



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areas for passing illumination into said material and the second  
of said surface areas for passing transmitted illumination from  
said material for detection, at least one of said surface areas  
of each of said paths being extended in length at substantially  
constant spacing from the other surface of said each of said  
paths, the total length of said extended surface area of said  
each of said paths being substantially greater than the distance  
separating said corresponding and separated surface areas defin-  
ing said each of said paths, an extended surface area of at least  
one of said paths being [distinct and] contained within the  
boundary defined by an extended surface area of another of said  
paths and being substantially surrounded by the extended surface  
area of said another of said paths;

means for directing illumination onto said illumination  
surface areas and along said transmission paths;

means for sensing optical information indicative of  
said material developed by illumination passing along said paths  
to said detection surface areas of said paths;

means, responsive to said sensing means, for developing  
a plurality of independent signals corresponding in number to  
said plurality of paths, said signals representing said optical  
information obtained from within said material; and

means for processing said signals in accordance with  
appropriate modeling techniques to determine qualitative or  
quantitative characteristics of the material.

Claim 37, line 1, insert after "claim 7" --or claim 36--.

Claim 38, line 1, insert after "claim 7" --or claim 36--.

of each of said paths being extended in length at substantially

as Claim 29, line 1, insert after "claim 7" --or claim 36--.

each Claim 42, line 1, insert after "claim 7" --or claim 36--

43. (Amended) Apparatus for effecting optical  
interactance and reflectance measurements relative to a material,  
having a characteristic to be measured, comprising:  
optical means, [when said apparatus is disposed] at a  
first predetermined distance from a surface of said material,  
for defining on said material at least one illumination surface  
area and at least one detection surface area which are [distinct]  
separated, said surface areas on said material defining at least  
one transmission path through an interior portion of said  
material for performing interactance measurements, at least one  
of said surface areas of one of said paths being extended in  
length at substantially constant spacing from the other surface  
area of said one path, and, [when disposed] at a second prede-  
termined distance, relative to the surface of said material, for  
defining illumination and detection surface areas on said

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material which are at least partially superimposed thereby  
defining a surface area on said material for performing diffuse  
reflectance measurements;

... said optical means including means for illuminating  
said illumination area [and] for detecting optical information  
received from said detection area, and for sensing signals  
representing said optical information obtained from said material  
in response to said illumination; and

means for processing signals detected by said optical  
means in accordance with appropriate modeling techniques to  
determine quantitative or qualitative characteristics of the  
material.

Claim 44, line 2, delete "when disposed".

Claim 45, line 2, delete "when disposed".

Claim 46, line 2, delete "when disposed".

Claim 47, line 2, delete "when disposed".

Claim 48, line 2, delete "when disposed".

Claim 49, line 2, delete "when disposed".